QA: QA

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Q-List

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CHANGE HISTORY

Revision Number	Interim Change No.	Effective Date	Description of Change
00	N/A	10/1/03	Initial issue as TDR-MGR-RL-000005. This initial issue supercedes YMP/90-55Q Rev. 07 to conform to AP-2.22Q Rev. 01. This initial issue classifies the preliminary license application design SSCs; combines the separate appendices for classification of MGR SSCs, Exploratory Studies Facility Engineered Items, and Natural Barriers that were a part of the superceded document into one list of SSCs and barriers important to safety or important to waste isolation. The former Exploratory Studies Facility Engineered Items were included in the MGR SSCs.
000	N/A	N/A	Initial issue as 000-30R-MGR0-00500-000-000. This initial issue supercedes TDR-MGR-RL-000005. The document identifier was changed to conform to the document numbering methodology for engineering documents. The former Exploratory Studies Facility Engineered Items were deleted from the document. This revision classifies the license application design SSCs and affects the entire document.
001	N/A	N/A	Complete revision supersedes 000-30R-MGR0-00500-000-000 and is issued to update classifications because of ongoing design evolution.

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ACRONYMS

SSCs	structures, systems, and components

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1. INTRODUCTION

The purpose of this report is to document the safety classification of the Yucca Mountain repository structures, systems, and components (SSCs) that are important to safety and to document the identification of natural and engineered barriers and other SSCs important to waste isolation, as described in *Safety Classification of SSCs and Barriers* (BSC 2005, Attachment A). This report supports the design and licensing activities for the Yucca Mountain Project.

2. QUALITY ASSURANCE

This report is subject to the quality assurance program requirements for classifying items important to radiological safety and waste isolation, as determined in *Quality Assurance Requirements and Description* (DOE 2004, Section 2.2.3). This report is developed in accordance with AP-2.22Q, *Classification Analyses and Maintenance of the Q-List*, AP-3.13Q, *Design Control*, and LP-3.11Q-BSC, *Technical Reports*. Input status of references is identified and tracked in accordance with LP-3.15Q-BSC, *Managing Technical Product Inputs*. The text of this analysis uses Microsoft Word and is exempt from the requirements of LP-SI.11Q-BSC, *Software Management*, per Section 2.1.1 of the procedure.

3. CLASSIFICATION METHODOLOGY

The methodology and process for classifying SSCs and natural and engineered barriers is provided in AP-2.22Q.

4. ITEMS IMPORTANT TO SAFETY AND WASTE ISOLATION

4.1 STRUCTURES, SYSTEMS, AND COMPONENTS

Information summarized in Appendix A for SSCs and natural or engineered barriers is from *Safety Classification of SSCs and Barriers* (BSC 2005).

4.2 NATURAL AND ENGINEERED BARRIER SYSTEMS

Information summarized in Appendix A, for postclosure natural and engineered barrier systems, is from BSC (2005). Natural and engineered barriers are grouped into the following three categories (Cereghino 2004, Enclosure):

- Engineered Barrier System (i.e., drip shield, waste package, waste form, cladding, and drift invert)
- Lower Natural Barrier (i.e., rock and alluvial material below and downgradient from the repository
- Upper Natural Barrier (i.e., soils and rock above the repository).

4.3 EXPLORATORY STUDIES FACILITY ENGINEERED ITEMS

This report does not include SSCs of the Exploratory Studies Facility identified in *Classification of Exploratory Studies Facility Engineered Items* (BSC 2004). The Exploratory Studies Facility SSCs are existing conditions that the repository design must evaluate at the time of Construction Authorization. Therefore, it would be inappropriate to treat the Exploratory Studies Facility SSCs as part of the repository.

5. SAFETY CLASSIFICATION CRITERIA

The following safety category screening criteria used in the classification of repository SSCs are summarized from AP-2.22Q:

Safety Category (SC) Criteria

Safety Category (SC)–SSCs that are credited for prevention or mitigation in a Category 1 or Category 2 event sequence, to meet the performance objectives in 10 CFR 63.111, are identified as ITS and classified as SC. Natural or engineered barriers that are important to meeting the performance objectives in 10 CFR 63.113 are identified as ITWI and are classified as SC.

Non-Safety Category (Non-SC) Criteria

SSCs and natural or engineered barriers that are not credited for compliance to the performance objectives in 10 CFR 63.111, or SSCs and natural or engineered barriers that are not important to meet the performance objectives in 10 CFR 63.113, are classified as Non-SC.

6. RESULTS

The safety classifications of SSCs and natural and engineered barriers are listed in Appendix A. As the design of the repository evolves, and further event sequence analyses and consequence analyses are performed, the supporting classification analyses for this report will be reviewed and revised as necessary.

7. REFERENCES

7.1 DOCUMENTS CITED

AP-2.22Q, Rev. 1, ICN 1. *Classification Analyses and Maintenance of the Q-List.* Washington, D.C.: U.S. Department of Energy, Office of Civilian Radioactive Waste Management. ACC: DOC.20040714.0002.

BSC (Bechtel SAIC Company) 2004. *Classification of Exploratory Studies Facility Engineered Items.* 000-PSA-MGR0-00100-000-000. Las Vegas, Nevada: Bechtel SAIC Company. ACC: ENG.20040607.0004.

BSC 2005. *Safety Classification of SSCs and Barriers.* 000-00C-MGR0-01000-000-000. Las Vegas, Nevada: Bechtel SAIC Company. ACC: ENG.20050215.0007.

Cereghino, S.J. 2004. "BSC Licensing Position, Selection of Barriers Important to Waste Isolation." Interoffice memorandum from S.J. Cereghino (BSC) to Distribution, March 30, 2004, 0330040960, with enclosure. ACC: MOL.20040522.0205.

DOE (U.S. Department of Energy) 2004. *Quality Assurance Requirements and Description.* DOE/RW-0333P, Rev. 16. Washington, D.C.: U.S. Department of Energy, Office of Civilian Radioactive Waste Management. ACC: DOC.20040907.0002.

7.2 STANDARDS, CODES, AND REGULATIONS

10 CFR 63. Energy: Disposal of High-Level Radioactive Wastes in a Geologic Repository at Yucca Mountain, Nevada. Readily available.

7.3 PROCEDURES

AP-2.22Q, Rev. 1, ICN 1. *Classification Analyses and Maintenance of the Q-List.* ACC: DOC.20040714.0002.

AP-3.13Q, Rev. 3, ICN 3. *Design Control.* ACC: MOL.20040202.0006.

LP-3.11Q-BSC, Rev. 0, ICN 1. *Technical Reports.* ACC: DOC.20040915.0003.

LP-3.15Q-BSC, Rev. 0, ICN 0. *Managing Technical Product Inputs.* ACC: DOC.20050113.0002.

LP-SI.11Q-BSC, Rev. 0, ICN 1. *Software Management.* ACC: DOC.20041005.0008.

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APPENDIX A

THE Q-LIST

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Table A-1. The Q-List

System or Subsystem	Component or Function	Important to Safety	Important to Waste Isolation	Safety Category
Balance of Plant Facilities				
Administration, Security, Utility, Emergency Response, Offsite, Materials and Consumables, Fire Water, Maintenance and Repair, Generator, Switchgear, Construction Support, Central Control Center, and Transportation Facilities	Structure	No	No	Non-SC
Canister Handling Facility				
Canister Handling Facility	Structure	Yes	No	SC
	Rails for: Trolleys, Waste Package Transporters, and SRTCs	Yes	No	SC
	Permanent Shielding (including shield doors, shield view ports, and viewing windows)	Yes	No	SC
Cask/MSC/WP Preparation System				
Cask Preparation	Cask Handling Crane (CHF, DTF) 200 ton	Yes	No	SC
	Naval Cask Handling Crane (DTF) 200 ton	Yes	No	SC
	Crane Lifting Yokes	Yes	No	SC
	Turntables	Yes	No	SC
	Cask Docking Ring	No	No	Non-SC
	Cask Pit Pedestal	No	No	Non-SC
	Cask Pit Protective Covers	Yes	No	SC
	Pit Crush Pad	Yes	No	SC
	Vestibule Gantry Crane (FHF) 200 ton	Yes	No	SC
	Main Transfer Room Crane (FHF) 200 ton	Yes	No	SC
	Mobile Elevating Platform	No	No	Non-SC
	Cask Pit Movable Platform	No	No	Non-SC
	Cask Trolleys, Pedestals, and Hold-Down Devices	Yes	No	SC
Waste Package Preparation	Waste Package Trolleys, Pedestals, and Hold-Down Devices	Yes	No	SC
	Waste Package Docking Ring	No	No	Non-SC
	Waste Package and Canister Handling Crane (CHF) 100 ton	Yes	No	SC
	Crane Lifting Yokes	Yes	No	SC
	Crush Pad	Yes	No	SC

Table A-1. The Q-List (Continued)

System or Subsystem	Component or Function	Important to Safety	Important to Waste Isolation	Safety Category
Cask/MSC/WP Preparation System (*Continued*)				
Waste Package Preparation (*Continued*)	Waste Package Pit Pedestal	No	No	Non-SC
	Waste Package Pit Protective Cover	Yes	No	SC
	Site Specific Cask Pit Pedestal	No	No	Non-SC
	Site Specific Cask Pit Protective Cover	Yes	No	SC
Cask Restoration	Entire	No	No	Non-SC
Cask Receipt and Return System				
SRTC Buffer	SRTC	Yes	No	SC
	SRTC Rails	No	No	Non-SC
	SRTC Positioner	No	No	Non-SC
	SRTC Positioner Turntable	No	No	Non-SC
	SRTC Tractor	No	No	Non-SC
Cask Receipt and Return	Cask Handling Crane (TCRRF) 250 ton	Yes	No	SC
	Crane Lifting Yokes	Yes	No	SC
	Crush Pad	Yes	No	SC
Communications System				
Communications	Entire	No	No	Non-SC
Digital Control and Management Information System				
Digital Control and Management Information	Entire	No	No	Non-SC
DOE and Commercial Waste Package System				
DOE and Commercial Waste Package	Waste Package See Also: Engineered Barrier System	Yes	Yes	SC
	Trunnion Collar	Yes	No	SC
DOE SNF Disposable Canister				
DOE SNF Disposable Canister	Standardized DOE SNF Canister	Yes	No	SC
	DOE Multicanister Overpack	Yes	No	SC
	DOE HLW Canister	Yes	No	SC
	Internal Geometry Control	Yes	No	SC
	Internal Neutron Absorbers	No	Yes	SC
Dry Transfer Facility				
Dry Transfer Facility	Structure	Yes	No	SC
	Remediation Pool	Yes	No	SC
	Rails for: Trolleys, Waste Package Transporters, and SRTCs	Yes	No	SC
	Permanent Shielding (including shield doors, shield view ports, and viewing windows)	Yes	No	SC

Table A-1. The Q-List (Continued)

System or Subsystem	Component or Function	Important to Safety	Important to Waste Isolation	Safety Category
Dual-Purpose Canister				
Dual-Purpose Canister	Entire	Yes	No	SC
Electrical Power System				
Switchyard	Line End Transmission Tower; Line Side High Voltage Disconnect Switch; High Voltage Breaker; Load Side High Voltage Disconnect Switch; Main Transformer; and Nonsegmented Bus to 12.47kV Main Switchgear	Yes	No	SC
Normal Power	12.47kV Main Switchgear; 12.47kV to 4.16kV Distribution Transformer to Emergency Switchgear Bus A; 12.47kV to 4.16kV Distribution Transformer to Emergency Switchgear Bus B	Yes	No	SC
	4.16kV Switchgear Bus A, B, C, and D; 12.47kV Switchgear C and D (located at South Portal), Standby Diesel Generators	No	No	Non-SC
Emergency Power	4.16kV Emergency Switchgear Bus A and B; Emergency Load Center Transformers for DTF 1, DTF 2, and FHF; Emergency Load Centers and motor control centers located in DTF 1, DTF 2, and FHF; and Feeders Up To and Including the ITS Loads	Yes	No	SC
	Emergency Diesel Generators A and B	No	No	Non-SC
Electrical Support System				
Lighting	Entire	No	No	Non-SC
Grounding	Entire	No	No	Non-SC
Lightning Protection	Entire	No	No	Non-SC
Cathodic Protection	Entire	No	No	Non-SC
Heat Tracing	Entire	No	No	Non-SC
Cable Raceway	The portion of Cable Raceway Subsystem that Supports ITS Functions of the Electrical Power System (including the switchyard, 12.47kV main switchgear A and B, 4.16kV emergency bus A and B, 480 V emergency load centers and motor control centers, 125 VDC, and 120 VAC UPS)	Yes	No	SC
	The portion of Cable Raceway Subsystem that Supports Non-SC Functions of the Electrical Power System (including portions of the normal power subsystem, standby power subsystem, and emergency diesel generators)	No	No	Non-SC

Table A-1. The Q-List (Continued)

System or Subsystem	Component or Function	Important to Safety	Important to Waste Isolation	Safety Category
Emplacement and Retrieval System				
Waste Package Transportation	Waste Package Transporter	Yes	No	SC
Waste Package Emplacement	Waste Package Emplacement Gantry	Yes	No	SC
Waste Package Retrieval	Components of This System Are the Same as Those In Waste Package Transportation, and In Waste Package Emplacement Subsystems	Yes	No	SC
Support Equipment	Transport Locomotive	Yes	No	SC
	Gantry Carrier	No	No	Non-SC
Engineered Barrier System				
Engineered Barrier	Drip Shield See Also: Subsurface Facility Subsystems, Emplacement Drift	No	Yes	SC
	Waste Package (including internals) See Also: DOE and Commercial Waste Package System, and Naval Spent Nuclear Fuel Waste Package System	Yes	Yes	SC
	Waste Form	No	Yes	SC
	Cladding	No	Yes	SC
	Drift Invert (ballast) See Also: Subsurface Facility Subsystems, Emplacement Drift	No	Yes	SC
Environmental/Meteorological Monitoring System				
Environmental/ Meteorological Monitoring	Entire	No	No	Non-SC
Fire Protection System				
Fire Protection	Entire	No	No	Non-SC
Fuel Handling Facility				
Fuel Handling Facility	Structure	Yes	No	SC
	Rails for: Trolleys and Waste Package Transporters	Yes	No	SC
	Permanent Shielding (including shield doors, shield view ports, and viewing windows)	Yes	No	SC
HVAC Plant Heating and Cooling System				
HVAC Plant Heating and Cooling	Entire	No	No	Non-SC
Low-Level Radiological Waste Generating System				
Low-Level Radiological Waste Generating	Entire	No	No	Non-SC

Table A-1. The Q-List (Continued)

System or Subsystem	Component or Function	Important to Safety	Important to Waste Isolation	Safety Category
Low-Level Radiological Waste Management System				
Low-Level Radiological Waste Management	Entire	No	No	Non-SC
Lower Natural Barrier				
Unsaturated Zone Below the Repository Horizon and Saturated Zone Below and Down Gradient from the Repository	Entire	No	Yes	SC
Naval Spent Nuclear Fuel Canister				
Naval SNF Canister Internals	Naval SNF Canister Baskets, Loading Sleeves and Cans; Control Rods or Neutron-Absorbing Material and Their Attachment Hardware; and SNF Cladding	No	Yes	SC
Naval SNF Canister	Naval SNF Canister	Yes	Yes	SC
Naval Spent Nuclear Fuel Waste Package System				
Naval SNF Waste Package	Entire See Also: Engineered Barrier System	Yes	Yes	SC
	Trunnion Collar	Yes	No	SC
Non-Nuclear Handling System				
Non-Nuclear Handling	Entire	No	No	Non-SC
Non-Radiological Waste Management System				
Non-Radiological Waste Management	Entire	No	No	Non-SC
Plant Services System				
Plant Services	Entire	No	No	Non-SC
Radiation/Radiological Monitoring System				
Radiation/Radiological Monitoring	Entire	No	No	Non-SC
Remediation System				
Dry Remediation	Trolleys, Pedestals, and Hold-Down Devices	Yes	No	SC
	Turntable	Yes	No	SC
	Docking Station	Yes	No	SC
Wet Remediation	Cask Handling Crane 200 ton	Yes	No	SC
	Pit Crush Pad	Yes	No	SC
	Pool Crush Pad	Yes	No	SC
	Turntable	No	No	Non-SC
	Fuel Handling Machine and Grapples	Yes	No	SC
	Crane Lifting Yokes	Yes	No	SC
	Staging Racks/Baskets in Remediation Pool	Yes	No	SC

Table A-1. The Q-List (Continued)

System or Subsystem	Component or Function	Important to Safety	Important to Waste Isolation	Safety Category
Remediation System (*Continued*)				
Waste Package Remediation	Waste Package Remediation Crane 100 ton	Yes	No	SC
	Crane Lifting Yokes	Yes	No	SC
	Waste Package/DPC Trolleys, Pedestals, and Hold-Down Devices	Yes	No	SC
Safeguards and Security System				
Safeguards and Security	Entire	No	No	N/A
SNF Aging System				
Cask Transfer	Cask Tractor	Yes	No	SC
	Horizontal Cask Transfer Trailer	Yes	No	SC
	Site Specific Cask Transporter	Yes	No	SC
	Site Specific Transfer Cask	Yes	No	SC
Aging Pad	Surface Aging Pad	Yes	No	SC
	Support Structures (including utility buildings and personnel barriers)	No	No	Non-SC
	Aircraft Protection Barrier That Surrounds the Aging Pads	Yes	No	SC
Aging Cask	Site Specific Cask	Yes	No	SC
	Horizontal Aging Module	Yes	No	SC
SNF/HLW Transfer System				
Waste Package Loadout	Waste Package Handling Crane (DTF) 100 ton	Yes	No	SC
	Waste Package Loadout Handling Crane (DTF) 100 ton	Yes	No	SC
	Crane Lifting Yokes	Yes	No	SC
	Trolleys, Pedestals, and Hold-Down Devices	Yes	No	SC
	Waste Package Tilting Machine	Yes	No	SC
	Waste Package Turntable	Yes	No	SC
	Trunnion Collar Removal Machine	Yes	No	SC
DPC Cutting	DPC Cutting Machine	Yes	No	SC
	DPC Docking Station	Yes	No	SC
Dry Transfer	Spent Fuel Transfer Machine and Grapples (DTF, FHF)	Yes	No	SC
	Canister Handling Crane (DTF) 70 ton	Yes	No	SC
	Naval Canister Handling Crane (DTF) 70 ton	Yes	No	SC
	Crane Lifting Yokes	Yes	No	SC
	Cask/Waste Package Docking Station	Yes	No	SC
	Canister and SNF Staging Racks (DTF)	Yes	No	SC
	Canister Staging Pits (CHF)	Yes	No	SC

Table A-1. The Q-List (Continued)

System or Subsystem	Component or Function	Important to Safety	Important to Waste Isolation	Safety Category
Subsurface Facility				
Subsurface Facility	Rails	No	No	Non-SC
	Size and Layout of Drifts	Yes	Yes	SC
	Nonemplacement Openings	Yes	No	SC
	Ground Support for Nonemplacement Openings	No	No	Non-SC
Emplacement Drift	Emplacement Drift Excavated Opening	Yes	Yes	SC
	Emplacement Drift Ground Support	No	No	Non-SC
	Drift Invert (steel)	No	No	Non-SC
	Drift Invert (ballast)	No	Yes	SC
	Waste Package Emplacement Pallet	Yes	Yes	SC
	Drip Shield	No	Yes	SC
	Drip Shield Emplacement Gantry	No	No	Non-SC
Postemplacement	Thermal Management	No	No	Non-SC
	Decommissioning and Decontamination	No	No	Non-SC
	Closure (includes keyways and backfill in access mains and exhaust mains; ventilation shafts and raises and borehole seals)	No	Yes	SC
	Performance Confirmation	No	No	Non-SC
Subsurface Development	Excavation	No	No	Non-SC
Subsurface Ventilation System				
Subsurface Ventilation	Entire	No	No	Non-SC
Surface Industrial HVAC System				
Surface Industrial HVAC	Inlet and Outlet Dampers and Ventilation Ducting (including stack) for Fuel Element Staging Areas (DTF)	Yes	No	SC
	Structures, Systems, and Components Other Than Inlet and Outlet Dampers and Ventilation Ducting (including stack) for Fuel Element Staging Areas (DTF)	No	No	Non-SC
Surface Nuclear HVAC System				
Primary Confinement	Entire (DTF, FHF)	Yes	No	SC
Secondary Confinement	Entire	No	No	Non-SC
Tertiary Confinement	Entire	No	No	Non-SC
Transportation Cask				
Transportation Cask	Entire	Yes	No	SC
Transportation Cask Receipt/Return Facility				
Cask Receipt and Return Area	Structure	Yes	No	SC
Transportation Cask Buffer Area	Structure	No	No	Non-SC

Table A-1. The Q-List (Continued)

System or Subsystem	Component or Function	Important to Safety	Important to Waste Isolation	Safety Category
Upper Natural Barrier				
Topography and Surficial Soils and Unsaturated Zone to the Repository Horizon	Entire	No	Yes	SC
Warehouse & Non-Nuclear Receipt Facility				
Warehouse & Non-Nuclear Receipt Facility	Structure	No	No	Non-SC
Waste Package Closure System				
Welding (equipment)	Entire	No	No	Non-SC
Inerting (equipment)	Entire	No	No	Non-SC
Non-Destructive Testing (equipment)	Entire	No	No	Non-SC
Stress Mitigation (equipment)	Entire	No	No	Non-SC
Waste Package Identification	Entire	No	No	Non-SC
Spread Ring Installation	Entire	No	No	Non-SC
Material Handling	Entire	No	No	Non-SC
Remote Equipment Maintenance	Entire	No	No	Non-SC
Operations Control	Entire	No	No	Non-SC

NOTES: Components and functions are applicable to the CHF, DTF, and FHF, except when one or more facilities are individually identified (shown in parentheses) in the Component or Function column, for example (TCRRF) or (CHF, DTF).

The term "breach" means an opening of a cask, canister, or waste package, thereby initiating a Category 1 or Category 2 design basis event sequence.

The term "cask" refers to the transportation cask and the site specific cask, unless specified otherwise.

AC = alternating current; CHF = Canister Handling Facility; DC = direct current; DOE = U.S. Department of Energy; DPC = dual-purpose canister; DTF = dry transfer facility; FHF = Fuel Handling Facility; HLW = high-level radioactive waste; HVAC = heating, ventilation, and air-conditioning; MSC = monitored geologic repository site specific cask; Non-SC = Non-Safety Category; SC = Safety Category; SNF = spent nuclear fuel; SRTC = site rail transfer cart; TCRRF = Transportation Cask Receipt/Return Facility; UPS = uninterruptible power supply; WP = waste package.